

# **HEALTH ADVISORY AND SAFE EATING GUIDELINES FOR FISH FROM SAN PABLO RESERVOIR (CONTRA COSTA COUNTY)**

**February 2009**

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SAFE EATING GUIDELINES  
FOR FISH FROM  
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(CONTRA COSTA COUNTY)**

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## EXECUTIVE SUMMARY

Fish samples were collected from San Pablo Reservoir in 1997 because of concerns over potential chemical contamination from urban runoff and local cinnabar-enriched rock, as well as frequent use of this water body by subsistence fishers. Under the guidance of the Office of Environmental Health Hazard Assessment (OEHHA) and funding by the United States Environmental Protection Agency (U.S. EPA), the California Department of Fish and Game (CDFG) collected and analyzed fish for mercury and several organic contaminants. Selected composites were also sent to the Hazardous Materials Lab (HML) (now part of the California Department of Toxic Substances Control) for additional analyses. Sample size was not sufficient in the 1997 sampling for a complete health assessment and, thus, in 2000, the East Bay Municipal Utility District (EBMUD) collected additional fish for analysis with oversight by OEHHA. Samples were analyzed by CDFG with funding from the Toxic Substances Monitoring Program (TSMP). To protect public health in the period while this technical support document was being prepared, Contra Costa County, in consultation with the Office of Environmental Health Hazard Assessment, issued an interim public health notification for fish from the affected area in 2000 and, again, in 2004. The 2004 notification is included in Appendix 1.

Following publication of OEHHA's advisory tissue levels (ATLs, see below; Klasing and Brodberg, 2008) the contaminant data were re-evaluated by OEHHA to determine whether consumption advice provided by the interim advisory should be modified and to issue a state advisory. Newer "safe eating guidelines" also identify fish species with low contaminant levels considered safe to eat frequently. Based on this evaluation, a health advisory and safe eating guidelines were developed that allow fishers to select fish to eat from San Pablo Reservoir in quantities that maintain contaminant exposures within safe levels while supporting the benefits of fish consumption.

Mercury contamination of fish is a national problem that has resulted in the issuance of fish consumption advisories in most states, including California (U.S. EPA, 2003). Mercury is a trace metal that can be toxic to humans and other organisms in sufficiently high doses. Mercury occurs naturally in the environment, and is also redistributed in the environment as a result of human activities such as mining and the burning of fossil fuels. Once mercury is released into the environment, it cycles through land, air, and water. In aquatic systems, it undergoes chemical transformation to the more toxic organic form, methylmercury, which accumulates in fish and other organisms. Almost all fish contain detectible levels of mercury, more than 95 percent of which occurs as methylmercury. Consumption of fish is the major route of exposure to methylmercury in the United States.

The critical target of methylmercury toxicity is the nervous system, particularly in developing organisms such as the fetus and children. Methylmercury toxicity can occur to the fetus during pregnancy even in the absence of symptoms in the mother. In 1985, U.S. EPA set a reference dose (RfD; that is the daily exposure likely to be without significant risks of deleterious effects during a lifetime) for methylmercury of  $3 \times 10^{-4}$  mg per kg of body weight per day (mg/kg-day), based on central nervous system effects (ataxia, or loss of muscular coordination; and paresthesia, a sensation of numbness and tingling) in adults. This RfD was lowered to  $1 \times 10^{-4}$

mg/kg-day in 1995 (and confirmed in 2001), based on neurodevelopmental abnormalities in infants exposed *in utero*.

OEHHA finds convincing evidence that the fetus is more sensitive than adults to the neurotoxic effects of mercury, but also recognizes that fish play an important role in a healthy diet, particularly when it replaces other, higher fat sources of protein. These potential beneficial effects are thought to stem largely from unique fatty acids found in fish (docosahexaenoic and eicosapentaenoic acids) and include reduced rates of cardiovascular disease and stroke, decreased inflammation, and improvements in cognitive and visual function. Fish consumption during pregnancy, in particular, has been associated with higher cognitive scores in young children. Nevertheless, because the fetus has increased vulnerability to methylmercury, OEHHA will use the current U.S. EPA RfD, based on effects in the fetus, to establish fish consumption advice for women of childbearing age (18-45 years) and children 1-17 years. At the same time, OEHHA will encourage women 18-45 years to select and eat fish that are low in mercury or other contaminants and high in the fatty acids described above, which can benefit the developing fetus. The previous U.S. EPA RfD, based on effects in adults, will be used to establish fish consumption advice for women over 45 years and men, who are generally less sensitive to methylmercury.

Dieldrin is a chlorinated cyclodiene pesticide that was widely used in the United States until its registration was cancelled by U.S. EPA in 1989. Dieldrin accumulates in the aquatic environment and, thus, fish consumption can be a major source of human exposure. The nervous system is the most sensitive target organ in humans who have been acutely or chronically exposed to dieldrin; however, human data are not sufficient to derive toxicity criteria for this chemical. In 1990, U.S. EPA set an RfD for dieldrin of  $5 \times 10^{-5}$  mg/kg-day, based on increased liver weights in rats. A cancer slope factor (an upper-bound estimate of the probability that an individual will develop cancer over a lifetime as a consequence of exposure to a given dose of a carcinogen) for dieldrin of  $16 \text{ (mg/kg-day)}^{-1}$  was also set by U.S. EPA, based on development of liver cancer in mice. OEHHA will use these values to establish fish consumption advice for dieldrin.

Polychlorinated biphenyls (PCBs) are a class of synthetic organic chemical mixtures that were used in the United States from about 1930 to 1977 as coolants, hydraulic fluids, lubricating oils, and plasticizers. Although no longer produced, PCBs still exist in the environment as a result of previous accidental spills and leaks from PCB-containing products. Once in the environment, PCBs resist degradation; their chemical properties allow them to accumulate and biomagnify in the food chain, particularly in fish. Marine and freshwater fish consumption may account for a significant portion of human dietary PCB exposure. In humans, occupational or accidental high-level PCB exposures have been found to cause chloracne, a severe form of acne. Potential adverse effects resulting from low level PCB exposures (such as those currently found in the environment) have been difficult to confirm in humans; therefore, animal studies have been used to set toxicity criteria for this contaminant and have been derived from experiments using commercial PCB mixtures sold under the trade name Aroclors. Fish consumption is considered a PCB exposure route of high risk and persistence, so recommended health effects criteria are based on the cancer and non-cancer toxicity of the most toxic and persistent Aroclors. The RfD for high risk PCB exposure of  $2 \times 10^{-5}$  mg/kg-day was set by U.S. EPA in 1996 and is based on

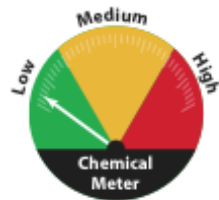
ocular inflammation, distorted nail growth, and decreased immune response in monkeys. Similarly, the cancer slope factor for high-risk PCB exposure of  $2.0 \text{ (mg/kg-day)}^{-1}$  is set for the most toxic and persistent Aroclors and is based on development of liver cancer in rats. OEHHA will use these values to establish fish consumption advice for PCBs.

In order to provide fish consumption guidelines for various fish species, contaminant concentrations in fish from a water body are compared to OEHHA advisory tissue levels (ATLs) for those chemicals, which are designed to determine the appropriate consumption rate (quantity of fish or shellfish consumed in a given time period) that would prevent exposure to more than the average daily RfD for non-carcinogens or a cancer risk level of  $1 \times 10^{-4}$  (1 in 10,000) for carcinogens. Best professional judgment is used to determine the most suitable data evaluation approach as well as the most appropriate method to convert a complex data set into more simplified and unified consumption advice for risk communication purposes. Ultimately, a health advisory and safe eating guidelines identify those fish species with high contaminant levels whose consumption should be avoided as well as those low-contaminant fish that may be consumed frequently as part of a healthy diet. For San Pablo Reservoir, a statistically representative sample size was available to provide safe eating guidelines for largemouth bass, channel catfish, carp, black crappie, and rainbow trout. Supporting data (such as mercury concentrations for a closely related species at a similar trophic level) were used to develop additional consumption guidelines for other black bass, trout, and catfish species.

For general advice on how to limit your exposure to chemical contaminants in sport fish (e.g., eating smaller fish of legal size), as well as a fact sheet on methylmercury in sport fish, see the California Sport Fish Consumption Advisories (<http://www.oehha.ca.gov/fish.html>) and Appendices 2 and 3. Advice for other California water bodies can be found online at: [http://www.oehha.ca.gov/fish/so\\_cal/index.html](http://www.oehha.ca.gov/fish/so_cal/index.html). It should be noted that the concentration of many fat-soluble organic contaminants (e.g., DDTs, dieldrin and PCBs) can be reduced by various cooking and cleaning techniques, such as removing the skin and trimming the fat and using a cooking method that allows the juices to drain away from the fish (see Appendix 3). However, these methods will not reduce the methylmercury content of fish, which is bound to the fillet muscle. There are no known ways to prepare fish (such as soaking in milk) that will reduce the methylmercury content of fish. Meal sizes should be adjusted to body weight. Consumers weighing less than 160 pounds should eat smaller portions than the standard eight-ounce portion (equal to six ounces after cooking), and children should also eat smaller portions, about half as much as adults for children up to the age of 12. The complete recommendations for consumption of fish from San Pablo Reservoir for women 18-45 years and children 1-17 years, and for women over 45 years and men are presented below.

# A guide to eating fish caught in San Pablo Reservoir

Women 18 - 45, especially those who are pregnant or breastfeeding, and children 1 - 17



Trout ♥



Crappie

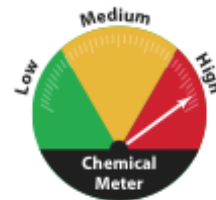
♥ = High in Omega-3s

**Safe to eat**

Trout – 5 servings per week OR  
Crappie – 2 servings per week



There are no fish with medium levels of chemicals



Largemouth, smallmouth, or  
spotted bass



Carp



Catfish

**Do not eat**

Men over 17 and women over 45  
can safely eat more fish

- **Safe to eat 5 servings per week** — trout or crappie
- There are no fish with medium levels of chemicals
- **Safe to eat 1 serving per week** — largemouth, smallmouth, spotted bass
- **DO NOT EAT** catfish or carp

**Fish buying guidelines for women 18 – 45 and children 1 – 17**

Do not eat fish caught by family or friends in the same week that you eat fish bought in a store or restaurant. For fish you buy:

- **Safe to eat 2 servings per week** of low mercury fish such as salmon ♥, pollock, catfish, tilapia, shrimp, anchovies ♥, sardines ♥, trout ♥, and canned chunk-light tuna



**OR**

- **Safe to eat 1 serving per week** of medium-mercury fish such as canned albacore (white) tuna ♥



- **Do not eat** shark, swordfish, tilefish, or king mackerel



## ♥ Why eat fish?

Eating fish is good for your health. Fish have Omega-3s that can reduce your risk for heart disease and improve how the brain develops in unborn babies and children.

## What is the concern?

Some fish have high levels of mercury, PCBs, and dieldrin. Mercury can negatively affect how the brain develops in unborn babies and children. PCBs and dieldrin might cause cancer.

## What is a serving?



For Adults For Children

The recommended serving of fish is about the size and thickness of your hand. Give children smaller servings.

California Office of Environmental  
Health Hazard Assessment

[www.oehha.ca.gov/fish.html](http://www.oehha.ca.gov/fish.html)

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